

OECD Survey of National Pesticide Risk Indicators, 1999-2000

COUNTRY, MINISTRY

The Netherlands

Ministry of Agriculture, Nature Management and Fisheries
The Institute for Environmental Protection and Health (RIVM)

CONTACT PERSON

Robert Luttik
RIVM
Centre for Substances and Risk Assessment
P.O. Box 1
NL-3720 BA Bilthoven
The Netherlands
Tel: 31 30 274 2795
Fax: 31 30 274 4401
Robert.Luttik@rivm.nl

INDICATOR NAME

Acute Aquatic Risk Indicator for Pesticides (AARI)

WHEN AND WHY WAS THE INDICATOR DEVELOPED?

In the Netherlands, government policies have been aimed at reducing pesticide use by 50%. Related to this is the desire to correspondingly reduce the risk to aquatic systems of pesticide use. Both the Ministry of Agriculture and the Ministry of Environment have indicated the need for such indicators to measure environmental risk reduction over time.

The Institute for Environmental Protection and Health (RIVM) has developed a pesticide indicator specific for acute aquatic risk (developed circa. 1997). Since the introduction of the Multi Year Crop Protection Plan in the Netherlands, the amount of pesticides used in the Netherlands has decreased by approximately 50%. One of the questions raised some years ago was: does a substantial decrease of the amount of pesticides used by the farmers have a proportional enhancement in the quality of the aquatic environment? To answer this question, an indicator for the acute risk of pesticides in the aquatic environment was developed. This indicator is the quotient of the predicted environmental concentration and the toxicity for a certain group of organisms, which is scaled for the area treated with a compound and includes all the pesticides used since 1984. The risk for algae and daphnids has declined by 40% and for fish by 15%. Less than 20 pesticides accounted for approximately 85% of the height of the indicator.

The Ministry of Agriculture is also developing a set of overall environmental risk indicators that will be easy to communicate to politicians and, in 1999, published their first report. This report describes a group of indicators that are similar to the one described in the RIVM report. They are all acute indicators:
Surface water - drift; daphnids, algae, fish and aquatic ecosystems
Ground water - leaching; ground water organisms (e.g., crustaceans) or a 0.1 ug/L standard

Soil surface - spraying (nomograms of Kenaga); birds

HOW HAS THE INDICATOR BEEN USED?

RIVM has been using the aquatic risk indicator since 1997 to provide information for State of the Environment reports and Environmental Outlooks.

The Ministry of Agriculture is planning to use the indicator(s) to evaluate general and more specific progress toward pesticide risk reduction, concentrating first on environmental risk reduction. The information will be used in periodical reports on the progress of the pesticide reduction plan.

DESCRIPTION OF THE INDICATOR: RIVM Indicator

TYPES OF RISK

Aquatic
Acute

ROUTES OF EXPOSURE

Spraydrift

VARIABLES INCLUDED

Pesticide Active Ingredient:

i) Physical-chemical and fate properties: not used.

ii) Toxicity:

LC50/EC50 *Daphnia* (mg/L)

LC50 fish (mg/L)

EC50 algal growth (mg/L)

Pesticide use variables:

1. application rate (kg/ha; national averages per active ingredient; will vary based on crop, growth stage, region; expert estimation may be used based on registered product labels, farmer surveys, ISBEST 3.0, other inquiries)

2. total area treated (ha)

3. fraction of area treated with each active ingredient (%)

Soil/site data: not used

Fate: estimation of losses due to spray drift (these data can be found in Document C-94.6, Driftpercentages - Lozingenbesluit, CTB (Dutch Authorisation Board for Pesticides))

Other: National sales data per active ingredient (kg)

METHODS OR FORMULAE FOR COMBINING VARIABLES:

Risk “intensity” = PEC/TOX

where:

PEC = PEC_{ditch} = the predicted environmental concentration (mg/L)
= mean dosage (kg/ha) * 0.4 * mean fraction drift

(This is the initial concentration in near-field surface water, i.e., ditch with a depth of 0.25 meters, and is based on a simple model calculation which uses application rate and losses due to spray drift)

TOX = acute toxicity to aquatic organisms (LC50/EC50, mg/L; geometric mean of available data)

Then, a risk index is calculated for each ratio of PEC/TOX:

Acute Aquatic Risk Index (AARI) = PEC/TOX * area-weighted average

where:

Area-weighted average = kg sold of active ingredient divided by the mean dosage. This will give the number of hectares treated with active ingredient and is expressed as a fraction of the total number of hectares treated by all compounds.

See Appendix I for examples of these calculations.

TOXICITY

Indices are calculated separately for *Daphnia*, fish and algae. The geometric mean of available data is used.

EXPOSURE VARIABLES

Only two exposure variables, application rate and losses due to spray drift, are combined (by multiplication) to determine a predicted concentration in near-field surface water.

TOXICITY AND EXPOSURE

Exposure/toxicity ratio concept.

RISK AND USE

Area-weighted average for each active ingredient

AGGREGATION OF PESTICIDES AND CROPS

The indicator is aggregated over all active ingredients. Mean dosages and the mean drift fraction depend

Mean application rate	kg/ha	0.19	0.53	0.015	etc.	etc.			
Drift	n/a	5.0%	1.0%	9.0%					
Loss to water	mg/m ²	0.95	0.53	0.135					
PEC _{int}	mg/L	3.8E-3	2.1E-3	5.4E-4					
EC50 _{algae}	mg/L	3.0E-3	1.0	8.0E-1					
E(L)C50 _{Daphnia}	mg/L	2.0E-3	2.0E+1	9.5E+1					
LC50 _{fish}	mg/L	3.0E-1	1.0E-3	4.3E+1					
TOX _{eco}	mg/L	2.0E-3	1.0E-3	8.0E-1					
PEC/TOX _{algae}	n/a	1.3	2.1E-3	6.8E-4					
PEC/TOX _{Daphnia}	n/a	1.9	1.1E-4	5.7E-6					
PEC/TOX _{fish}	n/a	1.3E-2	2.1	1.3E-5					
PEC/TOX _{eco}	n/a	1.9	2.1	6.8E-4					
Sales NL	kg	3.0E+5	4.0E+5	1.5E+4					
Area Treated	ha	1.6E+6	7.5E+5	1.0E+6			1.5E+7	1.2E+7	118%
Fraction Treated	%	11%	5%	7%			100%	100%	
AARI _{algae}	n/a	1.4E-1	1.1E-4	4.6E-5			0.19	0.30	62%
AARI _{Daphnia}	n/a	2.1E-1	5.5E-6	3.9E-7			0.29	0.50	58%
AARI _{fish}	n/a	1.4E-3	1.1E-1	8.6E-7			0.12	0.14	88%
AARI _{eco}	n/a	2.1E-1	1.1E-1	4.6E-5			0.48	0.74	65%